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IS PUBLIC EXPENDITURE ON PRIMARY EDUCATION EFFECTIVE? EVIDENCE FROM DISTRICTS ACROSS INDIA

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Abstract

Against the background of international commitment to the Millennium Development Goal (MDGs) for the universalization of primary education, this paper investigates the effectiveness of public spending on primary education outcomes in 115 districts across three states in India – Uttar Pradesh, Andhra Pradesh and Karnataka. Controlling for factors including per capita income, student-teacher ratio, and ratio of government to private primary schools, we find that primary educational spending has a negligible impact on enrollment rates, primary school transition rates, and performance of students on exams. Instead, districts with greater proportions of private primary schools are found to have consistently better outcomes. Higher per capita income is also correlated with some improved performance measures. Reducing the student-teacher ratio has no effect, a phenomenon possibly explained by rampant teacher absenteeism and lack of teacher motivation. Evidence from this study indicates that policymakers should seek alternatives to improve the quality of primary education, and determine how to achieve a more efficient and equitable allocation of educational funds.

I. Introduction

The Nobel Laureate Amartya Sen once famously said, "…illiteracy and innumeracy are forms of insecurity in themselves. Not to be able to read or write or count or communicate is a tremendous deprivation."[1] According to Sen (1999), schooling is desirable not only for individuals but for society as a whole. Education is the cornerstone of economic growth and social development. It creates greater social cohesion and a strengthened foundation for democracy. At the aggregate level, a better-educated workforce enhances a nation's stock of human capital, which is crucial for increased productivity and economic development (Barro, 1996; Romer, 1986; Lucas, 1988; Ravallion and Chen, 1997). From an economic standpoint, education is associated with high rates of return, both private and social. Among the different levels of education, primary education has been found to yield the highest social rates of return, especially in developing countries (Psacharopoulos and Patrinos, 2004). In recent years, there has been increased focus on achieving universal primary education in developing countries like India. A concerted effort to mobilize global efforts and resources to help developing countries was formalized through the endorsement of the Millennium Development Goals (MDGs) by 189 countries of the United Nations.[2] MDG target 2A specifically incorporates primary education by stating the following: "Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling."[3]

[1] In a speech made at Edinburgh, England in 2003

[2] The MDGs set targets to be achieved by 2015 for developing countries in eight areas: eradicating poverty, achieving universal primary education, promoting gender equality, reducing child mortality, improving maternal health, combating diseases like HIV/AIDS and malaria, ensuring environmental sustainability, and building a global partnership for development.

[3] http://devdata.worldbank.org/gmis/mdg/list_of_goals.htm

By promoting basic literacy and numeracy, primary education provides the foundation for secondary and tertiary education, allowing for a more knowledgeable and productive labor force. According to World Bank studies, primary education also has a direct and positive impact on future earnings and farmer productivity, and bestows significant health and poverty alleviation benefits (IEG, 2006). The world's second most populous country, India, is in need of those benefits. India has an average literacy level of just 61% and the largest absolute number of primary school age children out of school.[4] The country is also home to more than a third of the global poor.[5] Poor people facing credit market constraints incur higher private costs of sending their children to school; they can't afford to educate their children unless schooling is subsidized (IEG, 2006). Thus, government funding of primary education is crucial and necessary for greater nationwide enrollment. As universal primary education was made a fundamental right in 2003, the Indian government provides free primary schooling through its flagship program for the universalization of primary education, *Sarva Shiksha Abhiyan.* However, the question is, does public provision of primary education actually improve enrollment rates and learning outcomes?

Previous studies exploring this issue have produced mixed results. Some papers find that the relationship between public spending on education and educational outcomes is weak, and that factors such as per capita income, parental perceptions of costs and benefits, and family background or parental education matter as well (Mingat and Tan, 1992; Appleton et al., 1996; Flug et al., 1998). Pritchett and Filmer (1999a) show that educational achievements (test scores) are higher in schools where there is

[4] http://www.uis.unesco.org/template/pdf/educgeneral/OOSC_EN_WEB_FINAL.pdf
[5] Around 460 million people, a little more than 40% of India's population, live below the international poverty line of $1.25 per day.

greater parental involvement in school management to counteract teacher power. On the other hand, many studies find evidence that increased public expenditure on education plays an important role in impacting enrollment rates and other key educational outcomes across countries (Gupta et al., 2002; Baldacci et al., 2008). Gallagher (1993) shows that, after correcting for its quality and efficiency, spending on education positively affects educational outcomes. Mehrotra (1998) concludes that high education attainment is associated with relatively high public spending on education and a relatively high share of primary education in total education expenditures. However, Filmer and Pritchett (1999b) find that, once per capita income is taken into account, public expenditure on primary education loses explanatory power.

Although there has been a fair amount of research on the relationship between public spending and socio-economic outcomes (such as economic growth, health status or educational attainment) at a cross-country level, there have not been as many comprehensive and/or conclusive studies on educational spending and outcomes at the state and, especially, at the district level. Each of the studies just mentioned examines a set of countries, making cross-country comparisons in the process. Although they illuminate our understanding of the effects of spending, the papers implicitly assume outcome homogeneity across entire nations when comparing the determinants and outcomes of educational spending across them. Such analysis does not account for how public expenditure affects diverse cities and districts within countries. Other studies (Sipahimalani, 2000; Kaur and Misra, 2003) have analyzed the effects of public expenditure on education across states. However, state-level analysis is also far too broad to accurately determine the micro determinants of educational outcomes.

District-level analysis of primary education is required since different districts, even in the same state, have different characteristics and could therefore require unique developmental approaches. For example, the state of Uttar Pradesh has 70 districts spread across at least three geographically, economically and culturally diverse regions. Within these three different regions, each district has a distinct identity. Further, with the enactment of the 73rd and 74th Constitutional amendments in 1994, districts within states have become the key administrative units administering all major developing programs.[6] Districts now largely monitor their own primary education systems. From a policymaking standpoint, it is desirable to see whether such fiscal decentralization has been effective in achieving better learning outcomes. However, not many studies have comprehensively examined the effect of public expenditure on primary school enrollment and educational outcomes across districts. This paper contributes to the literature by investigating whether public spending on primary education has been effective at achieving educational outcomes in a detailed inter-state district-level study in India. Educational outcomes are analyzed in districts across the states of Uttar Pradesh (UP), Andhra Pradesh (AP), and Karnataka.

Evidence from this study questions the efficacy of educational expenditure. Controlling for factors including per capita income, the student-teacher ratio, and ratio of public to private primary schools, we find that public expenditure has little impact on enrollment rates, primary school transition rates, and performance of students on exams across the districts. Reducing the number of students per teacher also has no effect, a phenomenon possibly explained by widespread teacher absenteeism and lack of teacher motivation. Instead, districts with higher per capita incomes and comparatively more

[6] http://www.educationforallinindia.com/page91.html

private primary schools have better educational outcomes. The results indicate that simply spending more on primary education programs will not guarantee their attainment. Instead, policymakers should explore other options to improve the quality of primary education, and determine how to achieve a more efficient allocation of existing educational funds.

The remainder of the paper is organized as follows. Section II reviews the existing literature on governmental spending and educational outcomes. Section III provides a brief overview of the Indian education system, and places Indian educational statistics in the global context. Section IV presents the general theoretical framework used in the relevant literature. Section V describes the data and model I use to conduct my analysis. Section VI presents regression results, discusses my findings, and compares them to previous studies. Section VII concludes and offers policy suggestions for the future.

II. Literature Review

In theory, one would expect educational expenditures to be associated with better educational outcomes such as higher enrollment rates and increased school completion. Spending more on teachers, buildings, textbooks, and other such materials might provide students with better quality facilities and learning opportunities. However, empirical research has vigorously debated the question of whether education expenditures do in fact improve educational outcomes.

In a cross-sectional study of 50 developing countries, Gupta et al. (2002) use OLS and Two Stage Least Squares (2SLS) to determine the overall level of public spending and intrasectoral allocation. They use educational attainment measures like enrollment rates in primary and secondary school, persistence through Grade 4, and primary school

drop-out rates. The 2SLS technique is used primarily to address the problem of reverse causality. For instance, higher spending on primary education may have a positive effect on enrollment, but a higher demand for primary education, reflected in higher enrollment rates, may also provide a push for higher spending. Most spending and other data are for 1993-1994; the expenditure data, in general, exclude local government spending. Gupta et al. caution that this could be a major deficiency in countries that have devolved expenditure responsibilities to lower levels of government. Overall, the authors find that increased public spending on education and health care is positively correlated with educational attainment and health status, with the evidence being stronger for education. The authors further note that other socio-economic variables, such as urbanization and per capita income, are important determinants of educational attainment

Using panel data from 118 developing countries in 1971–2000, Baldacci et al. (2008) estimate a non-linear model to capture the spending-outcome relationship. They account for the interaction between education and health, and control for governance and the higher growth attributable to better human capital and country income levels. The fixed-effects model is utilized to make the most out of limited cross-country time series data, and minimize distortions from heterogeneity. Baldacci et al. find strong evidence that public expenditure on education directly results in increased better educational outcomes.[7] However, the positive effects of education spending are reduced in countries suffering from poor governance. The authors further find that higher spending alone is insufficient; other policy interventions, such as improving governance and taming inflation, must be incorporated to achieve the MDGs. They warn that their results should

[7] Increasing education spending by 1 percent of GDP would raise enrolment rates by 6 percentage points according to the authors.

be interpreted with caution given the wide variety of country circumstances and nonlinearity in the effects of public expenditure. Specifically, health and education spending would impact regions with different needs in non-homogenous ways. Baldacci et al. conclude that additional research is needed to assess the impact of different components of social expenditure.

In another study, Rajkumar and Swaroop (2008) empirically examine whether public expenditure on education is more effective in improving educational outcomes in countries with good governance. Their education results are based on a sample that has 101 observations from 57 countries using annual data for 1990, 1997 and 2003. The authors capture the direct effects of governance on educational outcomes by using the governance variable, Gi, as an independent regressor, and the indirect effects of governance by interacting Gi with the share of public primary education spending in GDP. They use OLS and 2SLS to estimate the impact of spending on outcomes such as the primary school completion rate, and control for the level of corruption, and the bureaucratic quality of the government. In their regressions, the coefficient on primary education spending becomes significant only when the interaction term between spending and good governance is included. Thus, as the level of corruption falls or the quality of the bureaucracy rises, public spending on primary education becomes more effective in achieving primary education attainment.

In a comprehensive global survey of the literature on the determinants of educational outcomes, Roberts (2003) finds that while developing countries need to commit more resources to primary education, they need to simultaneously improve efficiency in delivery and educational quality. Although developing countries have been

spending more (relative to GDP) since 1970 on education, Roberts notes that expenditure levels bear no strong relationship to primary school enrolment and completion rates. Increasing public investment alone does not seem to be enough to improve the quantity and quality of primary education. Based on a study of 37 African countries from 1984-1995, Gupta and Verhoeven (2001) find similar results that the effectiveness of service delivery is more important than the quantum of public spending. Higher spending on education and health does not necessarily improve social outcomes unless the efficiency of government spending is improved. These efficiencies arise due to relatively high government wages (in the case of education) and non-optimal intrasectoral allocation of resources. For example, many countries spend far too much on teacher salaries and not enough on teaching materials, educational facilities, and other crucial inputs. Reducing the student-teacher ratio does not significantly improve education attainment either.

Most of the studies mentioned above use cross-country datasets for their analysis. At the state level, Kaur and Misra (2003) have done a similar empirical analysis for fifteen states in India. They analyze the impact of public expenditure on primary and intermediate, and secondary school enrollment rates, controlling for variables such as the level of economic development and quantity of physical infrastructure in a state. Their panel regression results from 1985-86 and 2000-01 indicate that public expenditure on education has been generally productive, especially in poorer states. In terms of outcomes, public expenditure has a greater effect on primary education than secondary education. The role of public funding decreases at higher stages of education. The authors speculate that one of the reasons for this could be that private funding plays a greater role in secondary education. However, they caution that their study could be limited, as cross-

state analysis cannot directly assess and compare the micro-level outcomes of educational expenditure, such as improvements in local school management across districts.

Overall, the literature on public expenditure on education shows a mixed bag of results on educational spending and outcomes both within and across countries. Theoretically, there are several reasons why such analysis may fail to detect a relationship between spending on primary education and improved outcomes. Parental investments of time or money, and a child's intrinsic motivation may be more influential than the effect of public expenditure (Appleton et al., 1996). Also, higher expenditures may not translate into better educational outcomes in the absence of good governance or if the expenditures are used ineffectively (Rajkumar and Swaroop, 2008). For increased spending to improve primary school attainment, it must be accompanied by good governance, detailed monitoring and evaluation projects, and supply-side interventions such as building new schools and classrooms within easy walking distance (IEG, 2006). Shifting educational responsibilities to lower and more localized levels, such as district-level school-based management, can also improve educational outcomes. Activating community support and involving parent in primary school management can be advantageous as well.

III. Indian Education Programs and Progress

Educational provision in India, especially at the primary, intermediate and secondary levels, is largely determined by the extent and quality of targeted governmental spending. The central government and individual state governments share the responsibility of funding public education. State governments further pass down most of the educational planning and expenditure to the district-level; the extent of locally

transferred responsibility differs by states. The three stages of school-based education are primary, intermediate (middle school), and secondary (high school). Primary school includes children of ages six to eleven, organized into grades one through five. Intermediate pupils aged eleven through fourteen are organized into classes six through eight, and high school students aged fourteen through seventeen are enrolled in classes nine through twelve. Higher education includes technical schools, colleges, and universities.

In terms of public expenditure, 3.5% of GDP was allocated to the entire education sector in 2006. The state governments provide the major portion of the funds spent on primary education. Table 1 shows that state governments contribute more than three-fourths of the total revenue expenditure on education in the country.

Table 1: Expenditure on education (2006-07: Revenue Account)[8]

	Center	States / UT (Union Territories)	Total
Expenditure (Rs. in billions)	311.7	1012.8	1324.5
Share with respect to total (%)	23.5	76.5	100

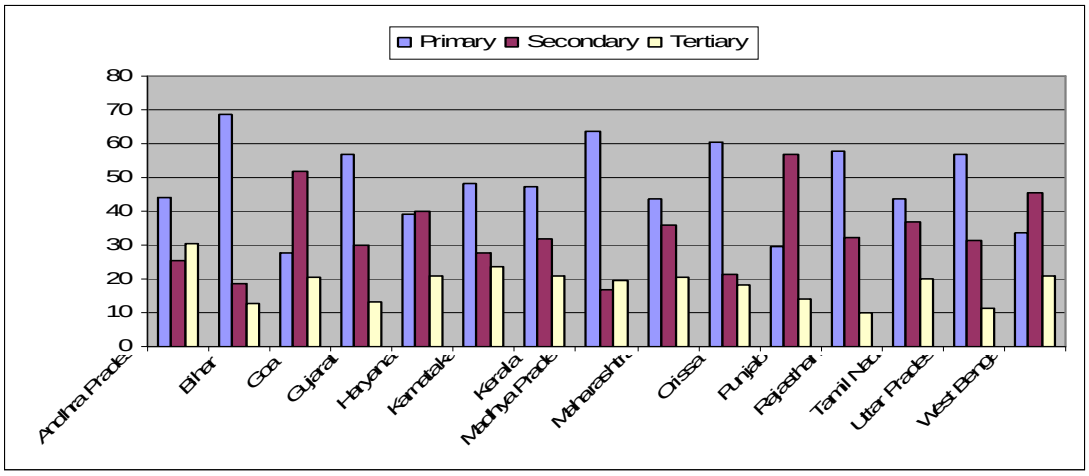
Source: Government of India, Ministry of Human Resource Development

Table 2 compares fifteen major Indian states in terms of their expenditure on primary, secondary (high school) and tertiary (university) education. Despite the evident political commitment to education, we can see that public expenditure on different education sub-sectors varies significantly between states. This phenomenon occurs because the states have diverse social and political environments, and are at different

[8] All rupees are measured in constant prices. In the Indian Financial Accounting system, the fiscal year starts on April 1 and ends on March 31. To convert rupees into dollars, the exchange rate as of 31st March of that particular year is quoted in a footnote wherever applicable. Here $1 = Rs 43.1

levels of development. Also, since decentralization affects each state in a different way, they accordingly allocate their budgets to the level of education that they deem the most important for overall development. A striking similarity, however, that emerges from Table 2 is that most states spend more on primary education than secondary or tertiary education. This suggests that there is a shared understanding that there are increased social rates of return associated with primary education, which in turn is aligned to the MDG of providing universal primary education.

Table 2: Sectoral composition of total expenditure on education

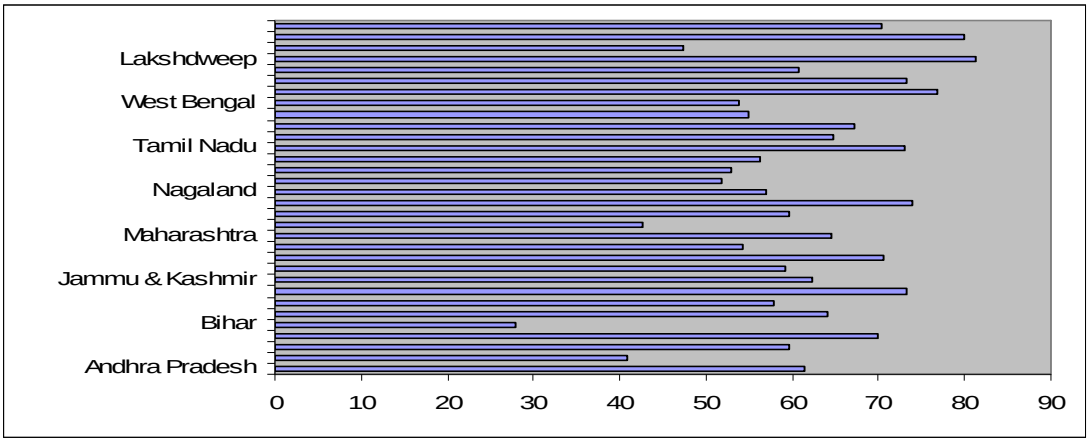


Source: Kaur and Misra (2003)

According to the UNESCO Institute of Statistics, the number of out of school children decreased from 30 million in 2000 to an estimated 9.6 million in 2007. This was a significant achievement, largely due to the two decades of basic education programs that expanded access to schools in India. However, there are still wide inter-state disparities in the net enrolment rate (NER), which is defined as the number of students enrolled in a level of education who belong in the relevant age group, as a percentage of the population in that age group. An important goal of the National Policy of Education is

to reduce the gap in NER across states. Table 3 displays data from the National Sample Survey of 2000 and highlights specific states. We can see that the NER differs widely across states; in 2000, while the NER was as low as 28% for Bihar, it was as high as 84% for Lakshdweep and 73% for Tamil Nadu.

Table 3: State-wise comparison of Net Enrollment Rate (NER)



Source: World Bank Site Resources. Data from National Sample Survey, 55th Round. (2000)

India and the World

India's educational achievements have had mixed success. On the down side, India has 46 per cent of the world's illiterates, and is home to a high proportion of the world's out-of-school children and youth. Absenteeism and low accountability of teachers is also perceived as a major problem across the country (Ramachandran 2005). On a more positive note, it has made encouraging recent progress in raising schooling participation (UNESCO). Table 4 presents India's adult male and female literacy rates alongside equivalent figures for its regional neighbors, as well as for countries in the BRIC grouping (Brazil, Russian Federation, India and China) – countries with which India is increasingly compared. While India does well compared to Bangladesh and Pakistan, it falls substantially behind all the other BRIC countries and Sri Lanka, and is

also behind the average for developing countries. Indeed, it is striking that its overall adult literacy rate is similar to – and female adult literacy rate lower than – that of Sub-Saharan Africa. India's male and female adult literacy rates are around 22 percent and 36.5 percent lower than those of China, another emerging "superpower". Further, India lags behind the average global literacy rate by a little more than 21%.

Table 4: Adult and youth literacy rates around the world

	Adult literacy rates (15+ years old)		
	Total	**Male**	**Female**
Bangladesh	42.6	51.7	33.1
Pakistan	49.9	63.0	36.0
Sri Lanka	90.7	92.3	89.1
India	61.0	73.4	47.8
China	90.9	95.1	86.5
Brazil	88.6	88.4	88.8
Russian Federation	99.4	99.7	99.2
World	82.2	87.2	77.3
Developing Countries	76.8	83.5	70.1
Sub-Saharan Africa	61.2	69.5	53.3

Source: 2000-2004 dataset from the Education for All Global Monitoring Report (UNESCO, 2006)

IV: Theoretical Framework

Two different models were useful to construct the model used in this paper. The former by Gupta et al. (2002) examines the impact of public expenditure across countries, while the latter by Kaur and Misra (2003) analyzes the impact of public expenditure across states in India.

Gupta et al. use the following model to evaluate the effectiveness of government spending on education and healthcare in a cross-sectional study across 50 developing and transition countries:

$$Y_i = f(X_{1i}, X_2i, Z_i)$$

where Yi is a social indicator reflecting education attainment or health status for a country i, X_{1i} the aggregate public spending on education or health care as a share of GDP; X_{2i} is allocations to different programs within the sector (i.e., primary education and primary health care) as a share of total sectoral spending; and Z_i is a vector of socioeconomic variables. Four measures of education attainment are used: gross enrollment in primary and upper-primary education, gross enrollment in secondary education, persistence through Grade IV, and primary school drop-out rates. The gross enrollment rate (GER) represents the number of students enrolled in a level of education as a percentage of total number of students of proper age for that specific level. The GER measure includes under-age and over-age children, as well as grade repeaters.

Kaur and Misra use a similar model to evaluate the impact of public expenditure across states in India:

$$Y_{it} = f(E_{it}, GSDP_{it}, X_{it})$$

where Y is a social indicator, E denotes social sector spending, GSDP is defined in per capita terms, X is the vector of other control variables. i denotes states in the sample, and t denotes time period. The model is estimated for two measures of education attainment: (a) gross enrolment in primary and secondary education and (b) gross enrolment in secondary education.

My project incorporates aspects from both the cross-country and cross-state models to construct a framework suitable for district-level analysis. While the dependent variable, Yi, in both models above represents a social indicator, the model I estimate denotes Yi as an educational outcome. Some educational outcomes and regressors in this paper are similar to the ones used in two models described above such as enrollments

rates (I use NER instead of GER), urbanization, literacy, and per capita income. The data and model used for analysis are described in detail in the next section.

V: Data and Methodology

This study analyzes the efficacy of primary educational expenditure from 2006-2007 on primary school enrollment rates and three other important educational outcomes. In addition to analysis at the district level, I also compare the effect of educational spending across a few states in India, especially those in different stages of human capital development. Table 4 presents relevant population characteristics for the three chosen states: Uttar Pradesh (UP), Andhra Pradesh (AP) and Karnataka. These states each have 70, 23 and 27 districts respectively. Net state domestic product (NSDP), measured in millions of rupees, and per capita income (PCI) are calculated in current prices. UP, the most populous state, has the lowest literacy rate of around 57%; AP is not far ahead as just 60.5% of adults are literate. We can see that Karnataka with an overall literacy rate of 66.6% has a higher percentage of literate males (76.1%) and literate females (56.9%) than both UP and AP. The average per capita income of Rs. 18324 (around $386) in Karnataka is almost twice the average per capita income in Uttar Pradesh. Both UP and AP have a fairly low level of urbanization with 20.8% and 27.1% respectively. Karnataka is a little more urbanized with 33.9% of the population living in urban areas.

Table 5: Major income, literacy and demographic statistics for UP, AP and Kerala[9]

	Uttar Pradesh	Andhra Pradesh	Karnataka
Population (2001 Census)	166,197,921	76,210,007	52,850,562
Area (square km)	238,556	275,068	191,791
Number of districts	70	23	27
Male literacy rate	68.8	70.3	76.1
Female literacy rate	42.2	50.4	56.9
Overall literacy rate (2001 Census)	57.36	60.5	66.6
Urban Population %	20.8	27.1	33.9
Net State Domestic Product (2002-2003)	Rs. 1704 billion	Rs. 1356 billion	Rs 973 billion
Per Capita Income (2002-2003)	Rs. 9,895	Rs. 17,642	Rs. 18,324

Source: Directorate of Economics & Statistics of respective State Governments (As on March 26, 2004), Ministry of Health and Family Welfare, Govt. of India

I have collected educational, income and expenditure statistics for 69 out of 70 districts in the state of Uttar Pradesh, all 23 districts in Andhra Pradesh, and all 27 districts in Karnataka. As complete district level data is available only for the 2005-06 and 2006-07 school years, I conduct panel analysis for these two years. The panel dataset has been compiled from a combination of Indian state government data and other publicly available data in the form of District Report Cards from the District Information System for Education (DISE). DISE, recently established in 2001, provides unique and comprehensive data at the state and district level for primary and upper-primary schools. These datasets cover 1.12 million primary schools (grades 1-5) and upper primary or intermediate schools (grades 6-8) schools in 609 districts in India. The Report Cards are based on school level data provided by the State Project/Mission Directors to the Department of School Education and Literacy.

[9] In constant 2003 prices, $1 equals approximately Rs. 47.5

Data Limitations

There are some data constraints in this study. As reliable and comprehensive district-level data is hard to obtain, this study is limited to 115 districts across three states over two years. The analysis is conducted over 2006 and 2007 as the recently instituted DISE has recorded comprehensive district-level educational statistics for only these two years so far. Next, a governance indicator has not been included in this analysis since a reliable measure of the quality of governance across districts is difficult to obtain. Further, although the Net Enrollment Rate (NER) is a better estimator of enrollment rates than the Gross Enrollment Rate (GER), it is still not a completely accurate measure of the number of children who actually attend primary school. Large enrolment rates measured at the start of the school year can mask non-attendance and/or dropout later in the school year. Thus, regression results for NER should be interpreted with some caution.

Lastly, this research would also have benefited by adding a health variable to explain differences in outcomes across richer and poorer districts. A healthier population is more likely to invest in education and some previous cross-country studies (Gupta et al., 2002; Baldacci et al., 2008) use under-5 child mortality rates as a proxy for the stock of health capital in a country. However, in India, the availability of data regarding the health and nutritional status of primary school students at the district level is extremely limited, and hence, despite considerable efforts, the health variable could not be used as an additional explanatory variable.

Model

Drawing upon the functional forms used in previous literature on educational spending (eg. Gupta et al. (2002), Kaur and Misra (2003), Baldacci et al. (2008), and Rajkumar (2008)), the following regression model estimates the impact of public expenditure on primary education:

$$Y_{i,t} = \beta_0 + \beta_1 expen_{i,t} + \beta_2 pci_{i,t} + \beta_3 pergov_{i,t} + \beta_4 str_{i,t} + \beta_5 expenlit_{i,t} + \beta_6 pciurban_{i,t} + \beta_7 strcaste_{i,t} + \alpha_i + u_{i,t}$$

where Y is an educational outcome, *expen* is expenditure per student in primary school, *pci* or per capita income is Gross District Domestic Product (GDDP) defined in per capita terms, *pergov* is the percent of government schools in a districts, *str* is the student teacher ratio, *expenlit* is the interaction between expenditure per student and percent literate adults in a district, *pciurban* is the interaction between per capita income and percent urban population in a district, *strcaste* is the interaction between student teacher ratio and percent scheduled caste population (people of lower social status) in a district, α_i is a district fixed effect, and $u_{i,t}$ contains all the remaining time-unit specific idiosyncratic error. i denotes states in the sample, and t denotes time period. The model is estimated for four educational outcomes: the net enrollment rate, primary school transition rate, percent of Grade V boys who obtain 60% or higher exam marks, and percent of Grade V girls who obtain 60% or higher exam marks.

Universal primary enrollment is a key Millennium Development Goal and necessarily an important outcome of effective public expenditure. I chose to use the net enrollment rate (NER) as opposed to the gross enrollment rate (GER) because the GER measure includes grade repeaters, and would misleadingly project increased enrollment

when children who failed have to repeat the grade again (sometimes multiple times). The transition rate measures the percent of Grade V students who successfully graduate from primary school and move onto Grade VI. Receiving more than 60% marks overall for both boys and girls represents satisfactory completion of the last grade in school. It proxies for the level of literacy attained, and would reflect the quality of education received.

The main regressor, public expenditure per student reflects the investments and costs associated with education. It covers public contributions to the full range of expenses, including school construction and maintenance, teacher salaries, learning materials, as well as loans and scholarships for tuition and student living costs. In addition to the expenditure variable, the regressions include important controls such as per capita income, percent public primary schools in a district, and the student-teacher ratio. Higher per capita income is usually associated with increased demand for education, if education is a normal good (Flug et al., 1998; Mingat and Tan, 1992). As household incomes rise, the relative cost of enrolling children in school is reduced, suggesting that increasing income would lead to higher enrollment rates. As government schools in India generally have fewer educational facilities and teachers compared to private schools, educational outcomes might be adversely affected with greater enrollment in public primary schools. In addition, as it is difficult to fire government schoolteachers, there is significant absenteeism and lack of motivation among them, making for poorer educational outcomes (Ramachandran, 2005). The student-teacher ratio could also potentially affect performance in primary school. According to UNESCO, the student-teacher ratio is an indicator of education quality. In crowded

classrooms with a high number of pupils per teacher, the quality of education could suffer.[10]

Other potential determinants of educational outcomes include literacy rates and urbanization levels. The adult literacy rate measures the percent of people above 15 years of age in a district who have basic primary school level skills, such as reading and writing. Adult literacy would proxy for the general attitude towards education. Generally, as people become more educated, they realize the benefits and returns to education and are more likely to enroll their children in school. Urbanization levels could potentially affect outcomes as well. As the private cost of education (e.g., transportation costs) may be lower for urban households, they are more inclined to send their children to school (Gupta et. al, 2002). In the Indian context, the percentage of scheduled caste population in a district is also an important control since scheduled caste people form India's lowest social group, are poorer, and may have lower enrollment rates (Jenkins and Barr, 2006).

[10] http://www.uis.unesco.org/template/pdf/ged/2005/ged2005_en.pdf

VI: Empirical Results

Summary statistics for 115 districts across UP, AP and Karnataka are presented below.[11]

Table 6: Summary statistics[12]

Variable	Observations	Mean	Std. Dev.	Min	Max
Expenditure per primary school student	230	2971.05	1646.5	546.6	9019.36
Per capita income	230	20720.22	10098.61	6351.63	83056
Percent public primary schools	230	78.18	11.63	23	96
Student-teacher ratio	230	43.67	18.19	16	88
Percent literate adults	230	59.1	9.87	33.8	83.30
Percent urban population	230	22.9	15.6	2.8	100.00
Percent scheduled caste population	230	19.25	5.93	6.1	41.90
Net enrollment rate (NER)	230	87.63	13.82	52.4	100.00
Transition rate	230	75.56	15.63	33.6	100
Percent girls with >60% exam marks in Grade V	230	52.27	17.91	15.2	89.50
Percent boys with >60% exam marks in Grade V	230	53.68	17.02	16.4	88.30

Source: Author's calculations

Some noteworthy findings emerge from observing the summary statistics. The expenditure per student ranges from Rs. 547 to Rs. 9019 across districts, with a mean of Rs. 2971 (around $67). The district that spends the maximum amount per student invests about 18 times the money spent by the lowest spending district. The mean student teacher ratio is 43.7 with a standard deviation of 18.2. Further, we can see that per capita income differs widely across the districts with minimum value of Rs. 6351 and a maximum value of Rs. 83056. Around 78% of primary school age children are enrolled in government schools across Uttar Pradesh, Andhra Pradesh and Karnataka. It should be noted that

[11] Separate summary statistics for the three states are presented in Appendix 1

[12] Expenditure per student and per capita income are measured in constant Rupees (Rs.) and $1equals approximately Rs. 44.5. Student-teacher ratio is the absolute number of students per teacher. All other variables are measured in percentages.

along with the district fixed effects (such as culture and attitude toward education), three other controls do not vary across the time period 2006-2007 since they were obtained from the 2001 Census of India. These are (i) overall literacy rate, (ii) percent urban population, and (iii) percent lower caste population. The average adult literacy rate is just 59.1% and dips as low as 33.8% in one district. The degree of urbanization varies considerably from just 2.8% to a maximum of 100%, with a mean of 22.9%. Lucknow, the capital of Uttar Pradesh, and Hyderabad, the capital of Andhra Pradesh, have by far the greatest degree of urbanization with 63.6% and 100% respectively. About one-fifth (19.3%) of the population on average belongs to the scheduled caste category.

We now briefly turn to the summary statistics concerning educational outcomes. The average net enrollment rate (NER) is 87.6% across the districts, and ranges from 52.3% to 100%. Since the NER is already so high, universal enrollment has almost been achieved and it would be interesting to see whether primary school expenditure boosts it up further. It should be noted that, on average, 75.6% of children complete primary school and move on from Grade V to Grade VI. Moreover, with a minimum value of 33.6% and a maximum value of 100%, there is considerable discrepancy in the transition rate across districts. About 52.2% of girls and 53.7% of boys pass Grade V with more than 60% examination marks. The difference in average exam marks is not statistically significant as the standard deviation from the mean is 18% for girls and 17% for boys.

Estimation of the Model

Panel analysis can make use of either the fixed effects method or the random effects method. To determine which method produces consistent estimates, time-invariant heterogeneity is an issue that must first be dealt with. Time-invariant district-specific

conditions include unique cultural characteristics, attitude toward education, and basic geography and location. If such characteristics remain fixed over time, then the fixed effects estimator produces consistent estimates. Unlike fixed effects, the random effects model makes the strong assumption that the unobserved fixed effects are uncorrelated with the regressors. *If* this assumption holds true, then random effects produces a consistent and more efficient estimate than the fixed effects model.

A Hausman test can be used to compare the two estimators. Under the null, both estimators are consistent, but random effects is more efficient; under the alternative, only fixed effects is consistent. Thus, if the null is rejected, the test suggests that fixed effects should be used. I conducted the Hausman test in Stata to determine whether fixed effects or random effects should be used to estimate the model. As the χ^2 test statistic was 74.62 and the p-value was 0, H_0 was rejected at both the 5% and 1% significance levels, implying that the random effects method would yield inconsistent estimates. Intuitively too, using a fixed effects model is more realistic as we cannot assume that all unobserved fixed effects are uncorrelated with the regressors in the dataset. For example, peoples' attitude toward education could well be related to their per capita incomes and how literate they are. Similarly, cultural preferences might motivate people to live in rural or more urbanized areas. By controlling for such unobservable predictors, the fixed effect model greatly reduces the threat of omitted variable bias.

Incorporating time-invariant controls

The fixed effects model is useful because it adjusts for all fixed (or time-invariant) sources of heterogeneity between subjects that might bias the model results if they were not properly controlled. The corresponding drawback is that such fixed

variables cannot be explicitly included in the model. At first glance, this looks like a serious problem for the present analysis, since three variables of great interest are fixed quantities for each district. As the controls, (i) *%urban population, (ii) % scheduled caste population,* and *(iii) % literate adults* are time-invariant, their coefficients cannot be estimated by the fixed effects model. However, we can include them in the overall analysis through interaction terms.

Three interaction terms were chosen after careful analysis. The first one, *expenditure per primary school student (in logs) * percent overall literacy*, captures whether overall literacy rates potentially influence the effectiveness of educational spending. *Per capita income (in logs) * percent urban population* allows the effect of per capita income on the educational outcome to depend on the level of urbanization in a district. The third interaction term, s*tudent-teacher ratio * percent scheduled caste population* captures whether reducing the number of student per teacher is potentially more beneficial in districts with fewer scheduled caste people.

The following regression tables present panel data regression results for *Net Enrollment Rate* and the three educational outcomes, *transition rate*, *exam marks>60% for boys,* and *exam marks>60% for girls.* Each column reports a different regression, and each row reports a coefficient estimate and the t-statistics along with "*" denoting significance levels. The number of observations and the R-squared are presented below the regression. Drawing upon some previous studies including Gupta et al. (2002) and Baldacci et al (2008), the income and expenditure variables are logged, and both OLS and fixed effects are utilized. It should be noted, however, that the coefficients estimated by the latter model are of much greater interest since, as discussed, fixed effects produces

consistent estimates by reducing omitted variable bias. Significant findings are summarized and put into context after analyzing Tables 7, 8 and 9.

Table 7: Regression Results for *net enrollment rate (NER)*

Dependent variable =***Net Enrollment Rate***			
	OLS With interactions **(1)**	**Fixed Effects** Base model **(2)**	**Fixed Effects** With interactions **(3)**
Expenditure per Primary School Student (in logs)* UP dummy	3.075 (1.33)	1.301 (0.29)	4.709 (1.34)
Expenditure per Primary School Student (in logs) *AP Dummy	-22.704 (-4.23)***	-3.890 (-0.45)	-4.518 (-0.53)
Expenditure per Primary School Student (in logs) * Karnataka dummy	-18.475 (-3.66)***	13.083 (1.83)*	7.85 (1.01)
Per Capita Income (in logs)	-7.275 (-2.71)***	34.677 (3.73)***	22.581 (1.98)**
Percent Public Primary Schools	-0.299 (-3.87)***	-0.490 (-2.89)***	-0.453 (-2.63)***
Student-Teacher Ratio	-0.305 (-1.36)	0.099 (0.98)	-0.249 (-0.93)
Expenditure per Primary School Student (in logs) * Percent Literate Adults	-0.049 (0.91)		0.649 (2.11)**
Per Capita Income (in logs) * Percent Urban Population	-0.022 (-3.23)***		0.327 (0.29)
Student-Teacher Ratio * Percent Scheduled Caste Population	0.008 (3.75)***		0.012 (0.29)
Constant	185.647 (5.17)***	-249.33 (-2.69)***	-213.01 (-2.28)**
Observations	230	230	230
R-squared	0.566	0.476	0.507

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variable in Table 7, *net enrollment rate*, is regressed on (i*) expenditure per primary school student (in logs), (ii) per capita income (in logs), (iii) percent public primary schools, (iv) student-teacher ratio,* and three important interaction terms in OLS Column (1) and fixed effects Column (3). Column (2) represents the base fixed effects model. State-level interactions with expenditure have been included in all three columns to allow the effect of expenditure to differ across Uttar Pradesh, Andhra

Pradesh and Karnataka. The OLS model in Column (1) indicates that *expenditure per student* and *per capita income* are negatively associated with enrollment rates; it should be noted, however, that these results could suffer from omitted variable bias. We find as much when we use the fixed effects model in Column (2), where spending more per primary school student does not significantly influence the NER in both Uttar Pradesh and Andhra Pradesh. In Karnataka, however, increasing expenditure by 1% is predicted to increase enrollment by 0.14%.[13] This result is significant at the 10% level.

Per capita income positively and very significantly predicts enrollment rates in districts across all three states. As *per capita income* increases by 1% in a district, the *net enrollment rate* increases by 0.35% in Column (2). As we saw in the summary statistics, the average per capita income in richer districts is upto fifteen times the average per capita income in the poorest districts. This shows that controlling for other factors, richer families across districts are more likely to enroll their children in primary school. *Percent public primary schools* has a negative coefficient, which is significant at the 1% level. Districts with 10% more public schools have 5% lower enrollment rates; this could be explained if, in an effort to increase enrollment rates, the government is setting up more public schools in places where enrollment is lower. In actuality, under its flagship program for the universalization of primary education, *Sarva Shiksha Abhiyan* ("education for all"), the government has been opening new schools in places where schooling facilities are scarce.[14] Following such compensatory policies would produce a negative coefficient on *percent public primary schools*.

[13] To capture the effect of expenditure in Karnataka, we add the coefficients on *expenditure per primary school student* and e*xpenditure per primary school student * Karnataka dummy* (1.301+13.083 =14.384)
[14] http://www.igovernment.in/site/education-spreads-horizon-the-country-prospers/

The fixed effects model including interaction terms in Column (3) broadly confirms the findings in Column (2). Increasing public spending on primary schools does not significantly affect enrollment. Further, the effect of expenditure is insignificant now even in Karnataka. However, higher literacy levels are associated with improved enrollment rates across districts in all three states. Primary educational expenditure has a greater influence on enrollment in districts where a greater percentage of adults are literate. Districts with lower ratios of public to private primary schools have better enrollment rates. The student-teacher ratio does not influence enrollment; its effect is insignificantly different in districts where a greater proportion of the population is scheduled caste. Per capita income, however, is again significantly associated with higher enrollment rates. Its effect does not significantly differ between rural and more urbanized districts, suggesting that poor people are uniformly less likely to send their children to school. Indeed, Roberts (2003), in a global literature survey on educational outcomes finds that the elasticity of demand for education by poor families could be higher, since they often face higher opportunity costs of schooling. We now analyze the *primary school transition rate* in Table 8.

Table 8: Regression Results for *transition rate*

Dependent variable =***Transition Rate***			
	OLS With interactions **(1)**	**Fixed Effects** Base model **(2)**	**Fixed Effects** With interactions **(3)**
Expenditure per Primary School Student (in logs)* UP dummy	-4.48 (-1.58)	4.451 (1.10)	0.608 (1.04)
Expenditure per Primary School Student (in logs) *AP Dummy	-2.72 (-0.44)	17.104 (2.17)**	17.480 (2.21)**
Expenditure per Primary School Student (in logs) * Karnataka dummy	-3.83 (-0.66)	-10.551 (-1.63)	-12.646 (-1.36)
Per Capita Income (in logs)	2.507 (0.81)	2.218 (0.26)	12.384 (1.12)
Percent Public Primary Schools	-0.158 (-1.78)***	-0.503 (-3.26)***	-0.570 (-3.57)***
Student-Teacher Ratio	-0.427 (-3.77)***	0.077 (0.84)	0.187 (0.75)
Expenditure per Primary School Student (in logs) * Percent Literate Adults	0.037 (2.51)**		0.057 (1.65)*
Per Capita Income (in logs) * Percent Urban Population	-0.012 (-1.63)		-0.431 (-1.52)
Student-Teacher Ratio * Percent Scheduled Caste Population	0.004 (1.58)		-0.006 (-0.52)
Constant	95.01 (2.30)**	48.05 (0.57)	59.60 (0.69)
Observations	230	230	230
R-squared	0.573	0.263	0.282

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The regressions in Table 8 are organized like those in the previous table. We again include interactions between state-level dummies and *expenditure per primary school student* to capture the potentially different effect expenditure might have in districts across UP, AP, and Karnataka. OLS Column (1) indicates primary school spending is not a significant predictor of transition rates, and its effect remains insignificant across districts in all three states. *Percent public primary schools*, however, is significant at the 1% level. In districts with a larger percent of government schools, transition rates are reduced. *Per capita income* does not significantly influence the

percent of children who move onto Grade VI from Grade V. In Column (2), the fixed effects regression produces insignificant coefficients on expenditure in UP and Karnataka, suggesting that higher per student expenditure in districts across these states is not correlated with improved transition rates. However, *expenditure per primary school student *AP* dummy is significant at the 5% level, indicating that increasing expenditure per student by 1% would improve the *transition rate* by 0.02% in districts across Andhra Pradesh. *Per capita income* does not significantly affect transition rates, nor does reducing the *student-teacher ratio*. On the other hand, the ratio of government to private primary schools in a district matters. At the 1% significance level, increasing government primary schools by 1% in a district leads to a 0.5% reduction in the *transition rate*. This result is important, especially when we consider the enormous variation in *percent public primary schools* across districts (in some districts, less than 25% of primary schools are public while in other districts, more than 90% of primary schools are public). Thus, districts with higher ratios of public to private primary schools have comparatively fewer primary school students who graduate.

Three interaction terms are added to the fixed effects model in Column (3). *Percent public primary schools* is again a negatively significant predictor of transition rates. Increasing spending in AP improves transition rates; there is no likewise effect in districts across UP and Karnataka. The coefficient of 0.057 on the interaction term e*xpenditure per primary school student (in logs * percent literate adults* is significant, indicating that educational spending becomes more effective in districts where a greater percent of the population is literate. Districts with fewer students per teacher do not have significantly higher primary school transition rates, a result synonymous with much of

the literature. Further, the effect on the transition rate of reducing the student-teacher ratio is not significantly different in districts with fewer scheduled caste people. Higher per capita income is also not associated with better transition rates; moreover, its effect does not significantly differ between rural and more urbanized districts. We now consider whether public expenditure improves exam performance in primary school.

Table 9: Regression Results for *% students who get more than 60% in Grade V Exams*

Dependent variable =***Percent of Students who Score More than 60% in Exams in Grade V***				
	Boys		**Girls**	
	OLS With interactions **(1)**	**Fixed Effects** With interactions **(2)**	**OLS** With Interactions **(1)**	**Fixed Effects** With interactions **(2)**
Expenditure per Primary School Student (in logs)* UP dummy	-2.402 (-1.17)	-12.756 (-0.98)	-2.786 (-1.38)	-14.86 (-1.24)
Expenditure per Primary School Student (in logs) *AP Dummy	1.282 (0.27)	-10.226 (-1.61)	1.588 (0.34)	4.94 (0.86)
Expenditure per Primary School Student (in logs) * Karnataka dummy	10.518 (2.35)**	-5.572 (-0.99)	11.902 (2.70)***	0.045 (0.01)
Per Capita Income (in logs)	3.636 (1.53)	9.449 (1.09)	3.848 (1.64)*)	-1.35 (-0.17)
Percent Public Primary Schools	-0.050 (-0.74)	-0.210 (-1.68)*	-0.077 (-1.14)	-0.217 (-1.87)*
Student-Teacher Ratio	0.001 (0.04)	-0.056 -0.29)	0.032 (0.37)	-0.159 (-0.88)
Expenditure per Primary School Student (in logs) * Percent Literate Adults	0.039 (3.51)***	0.284 (1.27)	0.047 (4.25)***	0.337 (0.107)
Per Capita Income (in logs) * Percent Urban Population	-0.015 (-2.49)	-0.135 (-0.61)	-0.010 (-1.73)*	-0.281 (-1.37)
Student-Teacher Ratio * Percent Scheduled Caste Population	-0.006 (-3.47)***	0.009 (1.14)	-0.007 (-3.38)***	0.011 (1.41)
Constant	23.169 (0.73)	-2.31 (-0.03)	17.66 (0.56)	95.98 (1.53)
Observations	230	230	230	230
R-squared	0.776	0.153	0.803	0.139

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9 analyzes the effect of expenditure on the test scores of primary school students in Grade V, the final grade in primary school before students can move onto secondary school. It is important to see whether students are skilled enough to survive in higher grades, and this is proxied by getting more than 60% in Grade V exams. The outcomes, *percent of girls who get more than 60% exam marks* and *percent of boys who get more than 60% exam marks* are looked at separately. Each outcome is estimated through both OLS and fixed effects. The OLS regression in Columns (1) and (3) shows that expenditure does not have a significant effect on exam marks in Uttar Pradesh and Andhra Pradesh. However, increased expenditure is correlated with better exam marks in districts where literacy levels are higher. More literate parents would be able to share knowledge with their primary school-age children, and help them learn materials at home. *Per capita income* is an insignificant predictor for boys but significant at the 10% level for girls. Reducing the student teacher ratio is also not associated with more students obtaining satisfactory examination results.

Columns (2) and (4) use the fixed effects model. We find that increasing primary educational expenditure does not significantly predict that a greater percent of girls and boys would obtain more than 60% exam marks. Spending more per student is ineffectual in districts across all three states for both boys and girls. The interaction term, *expenditure per primary school student (in logs)* percent literate adults* is insignificant for both genders, suggesting that the result for this variable in OLS was suffering from omitted variable bias. Decreasing the student-teacher ratio is not associated with better test scores either. Even districts with fewer scheduled caste families do not have improved exam performance when the number of students per teacher is reduced. *Per*

capita income is an insignificant determinant of the educational outcome for both boys and girls. Richer districts with more people living in urban areas than rural areas do not have significantly better test scores in primary school. However, *percent public primary schools* significantly predicts test scores for both boys and girls. The coefficient of -0.21 on *percent public school* in Column (2) indicates that as public schools increase by 1% in a district, there is a 0.21% reduction in *percent of boys who get more than 60% exam marks.* Similarly, Column (4) predicts that as public schools increase by 1% in a district, *percent of girls who get more than 60% exam marks* decreases by 0.22%. Thus, districts with 10% fewer public schools would have approximately 20% more boys and girls who score greater than 60% in Grade V exams.

Summary of results

Table 10 below summarizes the significant findings. Overall, increasing ex*penditure per primary school student* does not significantly impact enrollment rates, primary school transition rates, or student performance on Grade V exams in the aggregated districts across UP, AP and Karnataka. Educational spending does seem to be more effective in increasing the *net enrollment rate* and *transition rate* in districts with higher levels of literacy, suggesting that educated families would be more likely to send their children to primary school. Although primary school expenditure has an insignificant effect on outcomes in the aggregate, when we examine each state separately, we find that educational spending does have a positive and significant effect on the *transition rate* in Andhra Pradesh and the *net enrollment rate* in Karnataka. The varying outcome improvements indicate that the efficacy of expenditure could be influenced by characteristics unique to districts within each state. The results suggest that broad cross-

country studies that assume homogeneous spending-outcome relationships across entire nations could be missing some crucial micro-level determinants of educational outcomes

Table 10: Summary of significant findings

Summary of outcomes using the fixed effects model

			Performance in Exams	
	Transition Rate	**NER**	**Boys**	**Girls**
Expenditure per Primary School Student (in logs)* UP dummy	-	-	-	-
Expenditure per Primary School Student (in logs) *AP dummy	Positive **	-	-	-
Expenditure per Primary School Student (in logs)* Karnataka dummy	-	Positive *	-	-
Per Capita Income (in logs)	-	Positive**	-	-
Percent Public Schools	Negative***	Negative***	Negative*	Negative*
Student-Teacher Ratio	-	-	-	-
Expenditure per Primary School Student (in logs) * Percent Literate Adults	Positive*	Positive**	-	-
Per Capita Income (in logs) * Percent Urban Population	-	-	-	-
Student-teacher Ratio * Percent Scheduled Caste Population	-	-	-	-

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the table above, we can see that higher per capita income is associated with increased primary school enrollment rates. This coincides with previous findings that poor people's children are less likely to enroll in primary school, and more likely to drop out in the course of the primary cycle than the children of the better-off (Roberts, 2003). Increasing p*er capita income*, however, does not have a significant effect on students' exam marks. It should be noted that *percent public schools* is the most significant predictor of educational outcomes. As the ratio of government to private primary schools in a district increases, the *net enrollment rate (NER)* and *transition rate* significantly decrease. Increasing public schools by 1% in a district is predicted to reduce enrollment

by around 0.5%. As mentioned earlier, the *net enrollment rate* regression could be impacted by reverse causality. Under *Sarva Shiksha Abhiyan*, the government has been opening new schools in places where schooling facilities are scarce.

However, setting up more schools does not seem to be improving the transition rate across districts. In districts with 1% more public schools, the transition rate decreases by 0.5%, indicating that districts with a lower ratio of public to private schools have better transition rates. This result is statistically significant at the 1% level. Districts with lower ratios of public to private primary schools also have significantly fewer girls and boys who do well in exams. Districts with 10% fewer government primary schools have approximately 20% more boys and girls who score greater than 60% in Grade V exams. *Percent of girls who get more than 60% exam marks* and *percent of boys who get more than 60% exam marks* in a district both increase significantly when the ratio of public to private schools decreases. This finding concurs with the literature on the relative effectiveness of public and private schools in India, which suggest that, controlling for student background, private schools are more effective in imparting learning (Tooley and Dixon, 2003). Unlike government schools, privately-run schools have a high level of accountability since they work according to the market mechanism. In a later study in 2005 comparing outcomes in private and public schools, Tooley and Dixon noted that the raw scores from student achievement tests were considerably higher in private than in government schools. For instance, in the district of Hyderabad in Andhra Pradesh, the two-year average test scores in Mathematics were more than 20 percentage points higher in private schools. The differential was even greater for English.

Of further importance is that the *student-teacher ratio* does not affect any of the educational outcomes. Using educational funds to hire more teachers in districts across UP, AP and Karnataka would not be an advisable policy. This could be due to lack of teacher motivation or a lack of appropriately qualified teachers (Ramachandran et al., 2005). Rampant teacher absenteeism could also be a problem. Kremer et al. (2005), in a national survey of teachers in India, found that 25% of government schoolteachers were absent on any given day. Of those who were actually present, only about half were found to be teaching. The Public Report on Basic Education (Probe, 1999) had similar reports of low levels of teaching activity in schools. To combat the problem, Ramachandran et al. (2005) recommend that teachers be closely monitored. In a national study examining teacher motivation in India, they find that teachers perform better when they are supervised or given the right incentives. These results are confirmed in a study by Pritchett and Filmer (1999a), who find that educational achievements are higher in schools with greater parental involvement to counteract teacher power. Even Abhijit Banerjee (2007) laments about the lack of parental involvement and the unaccountability of schoolteachers in India. For further investment in primary education to produce better outcomes, Banerjee believes it should be accompanied by more parental monitoring and community involvement in schooling.

VII: Conclusion

Against the background of international commitment to the Millennium Development Goal (MDGs) for the universalization of primary education, this study sought to examine the effectiveness of public spending on primary education outcomes in 115 districts across three states in India – Uttar Pradesh, Andhra Pradesh and Karnataka. Four performance measures were analyzed – *net enrollment rates*, *transition rates, percent of Grade V boys obtaining more than 60% exam marks* and *percent of Grade V girls obtaining more than 60% exam marks*. We find that primary educational spending improves enrollment rates in Karnataka and transition rates in Andhra Pradesh. None of the other three outcomes are significantly affected. Further, expenditure has an insignificant effect on all outcomes in Uttar Pradesh. Such heterogeneous effects of educational spending illustrate the importance of analysis at more localized levels, and bring into question some cross-country studies that assume outcome homogeneity across entire nations. The results here indicate that simply spending more on primary education programs will not guarantee their attainment. Public expenditure, *per se*, seems to be a very poor guide to the majority of outcomes across the three states. Instead, the ratio of government to private primary schools makes a significant difference. Students in districts with more private schools do comparatively better in primary school.

Overall, the results in this study have some important implications for primary educational spending strategies aimed at meeting the MDGs. The evidence suggests that policymakers need to focus on improving the *quality* of primary education, and make more effective use of public educational funds. As larger ratios of private schools are consistently correlated with better outcomes, district-wide private school voucher systems

should be considered, in order to redirect per-student spending from inefficient public schools to private primary schools. This would allow poor people to attend schools of their choice, and at the same time spur quality improvements in government schools. Vouchers could be allocated based on need, being reduced or cut-off for families above a certain income level. Indeed, many countries including the United States, Sweden, and Chile, have implemented voucher programs with success. Public-private partnerships should further be considered, as should contracting more primary schools to private institutions. Additionally, there is little dispute that primary school students would benefit from greater parental and community involvement in school management. Information sessions and workshops could be locally organized to alert parents and community members of their important role in supporting their children's early years of schooling. However, simply spending more on a variety of schemes will not guarantee better educational outcomes. Policymakers should concentrate on improving the efficiency of existing educational funds. The relative costs and benefits of the numerous government initiatives in primary education is a topic of much-needed future research.

Appendix

Appendix 1A: Summary statistics for Uttar Pradesh

Variable	Observations	Mean	Std. Dev.	Min	Max
Expenditure per primary school student	130	1930.772	786.3535	546.5968	4438.624
Per capita income	130	16038.14	8263.198	6351.625	70838.47
Percent public primary schools	130	80.08	9.81	45.4	96
Student-teacher Ratio	130	57.34	11.17	34.0	88.0
Percent literate adults	130	56.19	9.27	33.8	74.4
Percent urban population	130	19.68	13.97	2.8	67.1
Percent scheduled caste population	130	21.62	5.71	11	41.9
Net enrollment rate (NER)	130	92.56	12.58	48.4	100
Transition Rate	130	67.40	13.71	36.2	100
Percent girls with >60% exam marks in Grade V	130	37.57	9.81	15.2	65.6
Percent boys with >60% exam marks in Grade V	130	39.68	9.59	16.4	66.4

Appendix 1B: Summary statistics for Andhra Pradesh

Variable	Observations	Mean	Std. Dev.	Min	Max
Expenditure per primary school student	46	3441.68	918.24	1376.62	6272.72
Per capita income	46	26819.61	6855.51	17627.25	50875.05
Percent public primary schools	46	70.15	14.02	23.0	91.3
Student-teacher ratio	46	26.85	3.51	21.0	37.0
Percent literate adults	46	59.57	7.93	44.4	78.8
Percent urban population	46	26.06	18.54	10.6	100
Percent scheduled caste population	46	16.12	3.87	7.6	22
Net enrollment rate (NER)	46	76.67	12.64	54.6	100
Transition Rate	46	88.49	6.60	71.3	100
Percent girls with >60% exam marks in Grade V	46	69.00	8.00	52.3	92.6
Percent boys with >60% exam marks in Grade V	46	70.34	6.24	55.8	86.8

Appendix 1C: Summary statistics for Karnataka

Variable	Observations	Mean	Std. Dev.	Min	Max
Expenditure per primary school student	54	5002.28	1541.27	2255.17	9019.36
Per capita income	54	28203.50	12903.43	15291.00	83056.00
Percent public primary schools	54	80.46	10.62	43.7	94.5
Student -teacher ratio	54	24.96	7.02	16.0	43.0
Percent literate adults	54	65.71	9.63	48.8	83.3
Percent urban population	54	27.96	14.99	13.7	88.1
Percent scheduled caste population	54	16.21	5.31	6.1	26.5
Net enrollment rate (NER)	54	85.14	13.10	61.0	100
Transition rate	54	88.15	11.64	48.1	100
Percent girls with >60% exam marks in Grade V	54	68.22	14.76	33.9	91.5
Percent boys with >60% exam marks in Grade V	54	66.60	13.67	34.0	90.6

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